

ISSUE 5
1st DECEMBER, 1964

AIR REGISTRATION BOARD



**BRITISH CIVIL
AIRWORTHINESS REQUIREMENTS**

**SECTION
L
LICENSING**

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HEAD OFFICE CHANGE OF ADDRESS

Please note that as from 1st April, 1965, approximately, the Board's Head Office address will be:—

Air Registration Board,
Brabazon House,
High Street,
REDHILL,
Surrey.

Telephone No.: Redhill 5971

As from the above date the new address should be used for all applications for grant and extension of licences.

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FOREWORD

- 1 **PURPOSE** British Civil Airworthiness Requirements (hereinafter referred to as the "Requirements") of which Section L is a constituent part, are published by the Air Registration Board.
- 2 **INTERNATIONAL STANDARDS** In the requirements detailed in this Section, cognisance has been taken of the experience necessary for the grant and extension of licences, prescribed by the International Civil Aviation Organisation. Compliance with the requirements will ensure that the corresponding Standards promulgated by I.C.A.O., and current at the effective date of this section, have been met.
- 3 **ARRANGEMENT**
 - 3.1 Details of the subjects contained in this section are given in the CONTENTS.
 - 3.2 The usual system of progressive paragraph numbering is adopted but the number of digits is kept to a maximum of three by associating the system with paragraph headings. A paragraph heading applies to all succeeding paragraphs until another titled paragraph with the same, or a smaller, number of digits occurs.
- 4 **ISSUE AND AMENDMENT**
 - 4.1 When new issues of the Section are made or if, in exceptional circumstances, it is necessary to supplement or supersede any part of the published Section, suitable announcements will be made in the Aeronautical Press.
 - 4.2 Material differences from the previous issue are indicated by marginal lines.
- 5 **EFFECTIVE DATE** New requirements and amendments introduced into this section become effective on the date printed on the issue in which they first appear, unless a statement to the contrary is made in the text.
- 6 **APPLICATIONS AND ENQUIRIES** Applications for further copies of this Section should be addressed to the Technical Publications Department, Air Registration Board, Greville House, 37 Gratton Road, Cheltenham, Glos. Applications for permission to reproduce any part of the Requirements and all enquiries regarding their technical content should be addressed to the Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—I CATEGORIES AND CERTIFICATION RESPONSIBILITIES

I GENERAL

- 1.1 The privileges of licence categories are specified in the Fourth Schedule of the Air Navigation Order and repeated in the licences.
- 1.2 This Sub-section is concerned with experience requirements and examination syllabi and must be read in conjunction with A.R.B. Notice No. 3 and A.R.B. Notice No. 10.

2 CATEGORIES

- 2.1 **Category "A"—Aeroplanes.** Licences are granted for the types of aeroplane as detailed in paragraph 5 of A.R.B. Notice No. 10.
- 2.2 **Category "B"—Aircraft, including Rotorcraft.** Licences are granted for the types of aircraft as detailed in paragraphs 5 and 7 of A.R.B. Notice No. 10.
- 2.3 **Categories "C" and "D"—Engines.** Licences are granted for the types of engines as detailed in paragraph 6 of A.R.B. Notice No. 10.
- 2.4 **Categories "A" and "C"—Rotorcraft.** Combined licences ONLY are granted for rotorcraft, the types being detailed in paragraph 7 of A.R.B. Notice No. 10.
NOTE: A "C" licence granted under paragraph 2.3 cannot be used to certify rotorcraft engines.
- 2.5 **Category "X"—Compasses.** Licences are granted for direct-reading magnetic compasses and for specific types of remote-reading compasses.
- 2.6 **Category "X"—Instruments.** Licences are granted for the types of aircraft as detailed in paragraph 8 of A.R.B. Notice No. 10.
- 2.7 **Category "X"—Electrical.** Licences are granted for the types of aircraft as detailed in paragraph 9 of A.R.B. Notice No. 10.
- 2.8 **Category "X"—Automatic Pilots.** Licences are granted for specific types of automatic pilots.
- 2.9 **Multi-Category "X"—Instruments, Automatic Pilots and Compasses.** Licences are granted for specific types of aircraft as detailed in paragraph 10 of A.R.B. Notice No. 10.

3 CERTIFICATION RESPONSIBILITIES

- 3.1 A.R.B. Notice No. 3 is concerned with the responsibilities of all licence categories for certificates of maintenance and certificates of compliance.
- 3.2 Responsibilities of engineers licensed in Categories "A" and "C" for certificates of fitness for flight under the "A Conditions" are specified in the Second Schedule of the Air Navigation Order.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—2 GRANT, EXTENSION AND RENEWAL—GENERAL

- I **GENERAL** Licences are granted, extended and renewed subject to applicants complying with this Sub-section.

2. GRANT OF LICENCES

- 2.1 An applicant shall not be less than 21 years of age.
- 2.2 An applicant shall be able to read, write and converse in the English language.
- 2.3 An applicant shall have had the experience and shall pass the examinations for the category of licence required, as detailed in the appropriate chapter of this Sub-section.
- 2.4 A preliminary application on Form A.R.B. 300C, together with a Schedule of Inspection Work (Form A.R.B. 301), copies of which may be obtained from the Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2, shall be completed in respect of each application.
- 2.5 If the experience detailed in the preliminary application form and Schedule of Inspection Work is satisfactory to the Board, the applicant will be requested to complete and return a final application on Form A.R.B. 302, together with the appropriate fee.
NOTE: When a Course appropriate to the licence application is not an experience requirement, the satisfactory completion of such a Course is, nevertheless, an advantage since it will considerably reduce the number of different items required under each of the appropriate sub-headings of the Schedule of Inspection Work. (See Appendix to this Sub-section.)
- 2.6 In certain circumstances consideration may be given to the grant of a licence on the basis of a current licence granted under the law of a country other than the United Kingdom. Details of the appropriate requirements will be supplied by the Board on request.

3. EXTENSION OF LICENCES

- 3.1 An applicant shall have had the experience and shall pass the examinations for the extension required, as detailed in the appropriate chapter of this Sub-section.
- 3.2 A preliminary application on Form A.R.B. 300C, together with a Schedule of Inspection Work (Form A.R.B. 301), copies of which may be obtained from the Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2, shall be completed in respect of each extension.
- 3.3 If the experience detailed in the preliminary application form and Schedule of Inspection Work is satisfactory to the Board, the applicant will be requested to complete and return a final application on Form A.R.B. 302, together with the appropriate fee.
NOTE: When a Course appropriate to the licence application is not an experience requirement, the satisfactory completion of such a Course is, nevertheless, an advantage since it will considerably reduce the number of different items required under each of the appropriate sub-headings of the Schedule of Inspection Work. (See Appendix to this Sub-section.)
- 3.4 In certain circumstances consideration may be given to the extension of a licence to include categories and types endorsed on a current licence granted under the law of a country other than the United Kingdom. Details of the appropriate requirements will be supplied by the Board on request.

- 4 APPLICATION FOR RE-EXAMINATION Applicants who fail an examination will not be accepted for re-examination for the same duties of certification until additional experience has been obtained. On request, the Board will advise the applicant of the further practical experience considered necessary.

5 RENEWAL OF LICENCES

- 5.1 Licences are normally valid for a period of twelve months and will be renewed on application provided that, during the 24 months preceding the date of expiry of the licence, the holder has exercised the privileges of the licence or been engaged, for periods totalling at least six months, on work which can be considered as comparable with the duties and privileges for which the licence is rated. Where these conditions have not been fulfilled the engineer may maintain the validity of his licence by complying with the current requirements for the grant of a licence.
- 5.2 A licence which has elapsed for more than two years will not be considered for renewal without examination of the holder. Application should be made in accordance with current procedure. The extent of the examination will be dependent on the nature of the employment of the holder since the licence expired, and the degree to which such duties could be considered as comparable to those for which the licence is endorsed.
- 5.3 An application on Form A.R.B. 302, obtainable from the Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2, shall be completed and returned to the Board, together with the appropriate fee. Should re-examination be necessary, the holder of the licence will be notified by the Board.

**SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS'
LICENCES**

**CHAPTER LI—3 GRANT AND EXTENSION—CATEGORY "A"
AEROPLANES**

- 1 **EXPERIENCE REQUIRED** The table on page 9 shows the experience required in each case.

2 EXAMINATIONS

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.24, according to the construction and complexity of the type for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted.
- 2.2 Applicants for the EXTENSION of a licence already valid in Category "A" will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE: This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "A".

- 3.2 Practical arithmetical calculations, involving vulgar and decimal fractions, percentages and mensuration.
- 3.3 The various terms used in aeroplane construction and aerodynamics and the functioning of each component part of an aeroplane.
- 3.4 The preparation of a brief report, illustrated by sketches if necessary, describing the replacements required in the event of damage, defect or wear.
- 3.5 The inspection and checks for alignment after fitting of aeroplane structural components.
- 3.6 The inspection of control mechanisms for defects and deterioration.
- 3.7 The inspection during and after adjustment of flying controls.
- 3.8 The diagnosis and correction of faults experienced in flight arising from rigging, control settings and from other reasons.
- 3.9 General maintenance of the airframe (including equipment), minor repairs and replacement of approved parts.
- 3.10 Defects and deterioration of metallic materials ; treatments and methods of protection against corrosion.
- 3.11 Defects and deterioration of wooden structures, including treatments and methods of protection used.
- 3.12 Defects and deterioration of materials other than wood or metal. Treatments and methods used in rectifying defects and in protection.
- 3.13 The inspection and scope of investigation following heavy landings, lightning strikes and flight in severe turbulence or hail.
- 3.14 The methods of checking instruments for correct functioning ; the inspection of instruments and instrument installations for condition.
- 3.15 The methods of checking electrical installations for correct functioning ; the inspection of electrical installations for condition.
- 3.16 The principles of operation and the inspection of hydraulic and pneumatic systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.17 The principles of operation and the inspection of retracting undercarriage, nose-wheel steering and flap operating systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.18 The inspection of undercarriages, brakes, wheels and tyres.
- 3.19 The principles of operation and the inspection of cabin pressurisation and air conditioning systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.20 The principles of operation and the inspection of anti-icing, de-icing and windscreen wiper systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.21 The principles of operation and the inspection of fire warning and extinguishing systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.22 The principles of operation and the inspection of oxygen systems, life-saving apparatus and all safety equipment ; tests for functioning ; diagnosis and rectification of defects.

(syllabus continued on page 10)

EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORY "A" AEROPLANES

	For a type specified in paragraph 5.1 or 5.2 of A.R.B. Notice No. 10.	For a type specified in paragraph 5.3 of A.R.B. Notice No. 10.	For a type specified in paragraph 5.4 of A.R.B. Notice No. 10.	For a type specified in paragraph 5.5 of A.R.B. Notice No. 10.	For a type specified in paragraph 5.6 or 5.7 of A.R.B. Notice No. 10.
Aeronautical engineering experience, periods totalling:—	Without M.O.A. Approved Course	Without M.O.A. Approved Course	Without M.O.A. Approved Course	Without M.O.A. Approved Course	Without M.O.A. Approved Course
	3 years	2 years	3 years	3 years	3 years
AND					
this must include recent practical maintenance and/or inspection solely of aeroplanes prior to flight, periods totalling:—	1 year	6 months	18 months	2 years, INCLUDING 6 months recent practical maintenance on a type(s) specified in paragraphs 5.4, 5.5, 5.6 or 5.7.	2 years, INCLUDING 6 months recent practical maintenance on pressurised aeroplanes (See Note (ii)).
AND					
	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).

DEFINITION: A M.O.A. (Ministry of Aviation) Approved Course for this Category applies to ab-initio training and is one which includes practical training in the maintenance of aeroplanes.

NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-Section.

(ii) Applicants whose experience does not meet this requirement may be accepted if they have had 6 months recent practical maintenance experience on one or more of the types specified in paragraph 5.4 and some experience on pressurised aeroplanes. Applicants will be informed of experience considered necessary.

(iii) If the general experience requirement has been met for a type specified in paragraphs 5.4 to 5.7 but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to unpressurised or pressurised aircraft, as appropriate.

- 3.23 The assembly, installation and inspection of the mechanism by which the automatic pilot servo motors are connected to the aircraft flying controls. Functioning checks to prove correct operation of the automatic pilot and the recognition of fault conditions.
- 3.24 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—4 GRANT AND EXTENSION—CATEGORY "B" AIRCRAFT including ROTORCRAFT

- NOTE : (i) Licences are NOT granted in Category "B" to include the certification of the construction of parts and of the materials used therefor.
- (ii) Licences are NOT granted in Category "B" for the certification of aircraft of such size or complexity that they should, in the opinion of the Board, be certified only under the authority of an Inspection Organisation approved by the Board for the purpose. Such aircraft are detailed in A.R.B. Notice No. 10.

I EXPERIENCE REQUIRED

- 1.1 The table on page 11 shows the experience required for the GRANT of Category "B".
- 1.2 Applicants for the EXTENSION of Category "B" will, having regard to the type(s) for which the licence is valid in Categories "A" and "B", be informed of the experience considered necessary.

- 2 **EXAMINATION** Applicants will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. The examination will include aspects of BASIC AERONAUTICAL ENGINEERING applicable to the subjects concerned.

3 SYLLABUS

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "B".
- 3.2 The preparation of a preliminary inspection report. This includes items such as :— checking log books for evidence of routine maintenance ; whether the C. of A. is to be renewed after overhaul ; the modification state of the aircraft ; listing of time-expired components.

(syllabus continued on page 12)

EXPERIENCE REQUIRED FOR GRANT OF CATEGORY "B" AIRCRAFT including ROTORCRAFT

For a type specified in paragraph 5.1 or 5.2 of A.R.B. Notice No. 10.

For a type specified in paragraph 5.3 of A.R.B. Notice No. 10.

For a type specified in paragraph 7.1 of A.R.B. Notice No. 10.

The applicant shall hold a licence valid in Category "A" for the type of aircraft concerned.

The applicant shall hold a licence valid in Categories "A" and "C" for the type of rotorcraft concerned.

Recent experience of the major repair and overhaul of aircraft, periods totalling :—

1 year 18 months 2 years 1 year

Applicants must have completed a Schedule of Inspection Work on the type. (See Note.)

NOTE: For details of a Schedule of Inspection Work refer to the Appendix to this Sub-Section.

- 3.3 Methods of preparing the aircraft for complete inspection and overhaul. This includes procedures for jacking and supporting ; the removal of main components and systems ; cleaning prior to dismantling.
- 3.4 The method and sequence of detail inspection of components, systems and equipment. The preparation of inspection sheets from which a final report can be made.
- 3.5 The use of inspection equipment including crack detection apparatus. Knowledge of advantages and limitations of equipment and methods.
- 3.6 The preparation and lay-out of special workshops and the procedures for the overhaul and testing of component parts of pneumatic, hydraulic, air-conditioning, de-icing, fire-extinguishing and rotorcraft transmission systems.
- 3.7 Inspection of workshop processes such as welding, glueing, soldering, doping and protective treatments. Removal and assessment of corrosion including treatment and re-protection of ferrous and non-ferrous materials.
- 3.8 Methods of assembly and approved repair schemes applicable to major components including engine mounting structures. The inspection necessary before, during and after repair, including checking for alignment and symmetry.
- 3.9 The repair, inspection and testing of tanks, heat exchange units, fuel and oil systems and all types of control systems (except automatic-pilot).
- 3.10 The method of weighing an aircraft and the preparation of a weight schedule in accordance with British Civil Airworthiness Requirements.
- 3.11 Detailed knowledge of the procedure for final inspection of an aircraft after overhaul. The preparation of final inspection reports and log book entries. Clearance for flight test.
- 3.12 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—5 GRANT AND EXTENSION—CATEGORY "C" ENGINES

- 1 EXPERIENCE REQUIRED The tables on pages 14 and 15 show the experience required in each case.
- 2 EXAMINATIONS

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.23, according to the construction and complexity of the type for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted.

- 2.2 Applicants for the EXTENSION of a licence already valid in Category "C" will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "C".
- 3.2 Practical arithmetical calculations involving vulgar and decimal fractions, percentages and mensuration.
- 3.3 The various terms used in the construction of the engine.
- 3.4 The principles of operation, general construction and functioning of the engine, of each component part of the engine and of all ancillary devices necessary for the operation of the engine.
- 3.5 The principles of operation, arrangement and inspection of fuel, water/methanol, oil and coolant systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.6 The principles of operation and the inspection of carburettors, injectors and fuel control units ; tests for functioning ; diagnosis and rectification of defects.
- 3.7 The principles of operation of compressors and turbines ; super-charging ; the operation of controlling devices.
- 3.8 The principles of operation and the inspection of ignition systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.9 The methods of checking electrical installations for correct functioning ; the inspection of electrical installations for condition.
- 3.10 The principles of operation and the inspection of propellers and propeller controlling devices ; the preparation of propellers for installation ; checks during assembly to the engine and ground testing ; diagnosis and rectification of defects ; permissible limits for damage and methods of rectification.
- 3.11 The methods of checking engine instruments for correct functioning ; the inspection of instruments and instrument installations for condition.
- 3.12 The principles of operation and the inspection of fire warning and extinguishing systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.13 The principles of operation and the inspection of anti-icing and de-icing systems ; tests for functioning ; diagnosis and rectification of defects.

(syllabus continued on page 16)

EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORY "C" PISTON ENGINES

	For a type specified in paragraph 6.1 of A.R.B. Notice No. 10.	Without M.O.A. Approved Course	With M.O.A. Approved Course	For a type specified in paragraph 6.2 of A.R.B. Notice No. 10.	For a type specified in paragraph 6.3 of A.R.B. Notice No. 10.
Aeronautical engineering experience, periods totalling:—	3 years	2 years	3 years	3 years	3 years
AND					
this must include recent practical maintenance and/or inspection solely of engines prior to flight, periods totalling:—	1 year including 6 months on piston engines.	6 months on piston engines.	18 months including 6 months on piston engines.	2 years, INCLUDING 6 months recent practical maintenance on a type(s) specified in paragraph 6.3.	

AND

DEFINITION: A M.O.A. (Ministry of Aviation) Approved Course for this Category applies to ab-initio training and is one which includes practical training in the maintenance of engines installed in aircraft.

NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-section.

(ii) If the general experience requirement has been met for a type specified in paragraph 6.3 but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to supercharged engines.

**EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORY "C"
GAS TURBINE ENGINES**

Aeronautical engineering experience, periods totalling:—	For a type specified in paragraph 6.4 of A.R.B. Notice No. 10.	For a type specified in paragraph 6.5 or 6.6 of A.R.B. Notice No. 10.	For a type specified in paragraph 6.7 or 6.8 of A.R.B. Notice No. 10.
AND	3 years	3 years	4 years
this must include recent practical maintenance and/or inspection solely of engines prior to flight periods totalling:—	18 months, INCLUDING 6 months practical maintenance experience on gas turbine engines.	2 years, INCLUDING 6 months practical maintenance experience on gas turbine engines.	3 years, INCLUDING 9 months practical maintenance experience on gas turbine engines.
AND	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)).	Applicants must have completed a Schedule of Inspection Work on	Applicants must have completed a Schedule of Inspection Work on the type (See Note (i)) and must have satisfactorily completed an appropriate Course on the type.

NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-section.
(ii) If the general experience requirement has been met for a type specified in paragraphs 6.4 to 6.8 but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to propeller turbine or jet turbine engines, as appropriate.

- 3.14 The principles of operation and the inspection of hydraulic and pneumatic systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.15 Inspection, checks and procedures before, during and after the installation and removal of engines.
- 3.16 Safety precautions during ground running ; testing and adjustment during ground running in accordance with the manufacturer's recommended procedure ; recognition, diagnosis and rectification of running faults.
- 3.17 General maintenance of the engine, ancillary devices and associated systems ; methods of inspection for defects ; clearances and allowances for wear and distortion ; minor repairs and replacement of approved parts.
- 3.18 Defects and deterioration of metallic materials ; treatments and methods of protection against corrosion.
- 3.19 Defects and deterioration of non-metallic materials ; treatments and methods used in rectifying defects and in protection.
- 3.20 The inspection and scope of investigation following heavy landings, shock loadings, lightning strikes and flight in severe turbulence or hail.
- 3.21 The procedure for the partial dismantling and re-assembly of the engine to permit inspection and rectification which may be certified by an engineer licensed in Category "C".
- 3.22 The preparation of a brief report, illustrated by sketches if necessary, describing the replacement required in the event of damage, defect or wear.
- 3.23 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—6 GRANT AND EXTENSION—CATEGORY "D" ENGINES

- NOTE : (i) Licences are NOT granted in Category "D" to include the certification of the construction of parts and of the materials used therefor.
- (ii) Licences are NOT granted in Category "D" for piston engines of such size or complexity that they should, in the opinion of the Board, be certified only under the authority of an Inspection Organisation approved by the Board for the purpose. Such engines are detailed in A.R.B. Notice No. 10.
- (iii) Licences are NOT granted in Category "D" for gas turbine engines.

I EXPERIENCE REQUIRED

- 1.1 The table on page 18 shows the experience required for the GRANT of Category "D".

- 1.2 Applicants for the EXTENSION of Category "D" will, having regard to the type(s) for which the licence is valid in Category "D", be informed of experience considered necessary.

- 2 **EXAMINATION** Applicants will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. The examination will include aspects of BASIC AERONAUTICAL ENGINEERING applicable to the subjects concerned.

3 **SYLLABUS**

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "D".
- 3.2 Practical arithmetical calculations, involving vulgar and decimal fractions, percentages and mensuration.
- 3.3 The principles of operation of the engine.
- 3.4 The preparation of a preliminary inspection report to include checking of log book, reason for rectification or overhaul, particulars of any failure or defects noticed at the dismantling stage and details of inspection before cleaning.
- 3.5 Acceptable methods for cleaning engine parts, including use of trichlorethylene, proprietary cleaning agents, pip blasting and general precautions to be observed during use.
- 3.6 The method and sequence of detail inspection of all parts after cleaning, including checking for wear, mal-alignment, distortion and defects. The preparation of inspection sheets from which a final report can be made.
- 3.7 The use of aids to inspection including crack-detection and other non-destructive examination processes. Knowledge of advantages and limitations of equipment and methods used.
- 3.8 The care of, use of, and checking for accuracy of, precision measuring instruments and equipment.
- 3.9 Approved repair and salvage schemes for engine components and detail parts. Mandatory or desirable modification standard of rebuilt engine.
- 3.10 The systematic rebuilding and checking of engine sub-assemblies such as superchargers, carburettors, injectors and reduction gears. The correct sequence of all inspections and checks necessary during rebuild of the engine.
- 3.11 The final inspection of the rebuilt engine together with the preparation of final inspection report.

(syllabus continued on page 19)

EXPERIENCE REQUIRED FOR GRANT OF CATEGORY "D" ENGINES

For a type specified in paragraph 6.1 of A.R.B. Notice No. 10.	For a type specified in paragraph 6.2 of A.R.B. Notice No. 10.	For a type specified in paragraph 6.3 of A.R.B. Notice No. 10.
3 years	3 years	3 years
INCLUDING 3 months recent experience on a type(s) specified in paragraph 6.1.	INCLUDING 3 months recent experience on a type(s) specified in paragraph 6.2.	INCLUDING 6 months recent experience on a type(s) specified in paragraph 6.3.

AND

Applicants must have completed a Schedule of Inspection Work on the type. (See Note.)

If the applicant holds a licence valid in Category "C" for the type of engine concerned, the experience required is reduced as follows:—

Recent experience of the complete overhaul, repair and testing of aircraft piston engines, periods totalling:—	1 year, INCLUDING 3 months on a type(s) specified in paragraph 6.1.	18 months, INCLUDING 3 months on a type(s) specified in paragraph 6.2.	2 years, INCLUDING 3 months on a type(s) specified in paragraph 6.3.
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AND

Applicants must have completed a Schedule of Inspection Work on the type. (See Note.)

NOTE: For details of a Schedule of Inspection Work refer to the Appendix to this Sub-section.

Recent experience of the complete overhaul, repair and testing of aircraft piston engines, periods totalling:—

- 3.12 The testing of an engine after rectification or overhaul ; suitability of test equipment ; measurement of power developed and of the fuel and oil consumption.
- 3.13 Methods used for inhibiting the engine against corrosion. Preparation for storage and transit.
- 3.14 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—7 GRANT AND EXTENSION—CATEGORIES "A" AND "C" ROTORCRAFT

NOTE : The term "Rotorcraft" is intended to cover both the aircraft and its engine installation.

- 1 EXPERIENCE REQUIRED The table on page 22 shows the experience required in each case.

2 EXAMINATIONS

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.34, according to the construction and complexity of the type for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted.
- 2.2 Applicants for the EXTENSION of a licence already valid in Categories "A" and "C" Rotorcraft will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Categories "A" and "C".
- 3.2 Practical arithmetical calculations involving vulgar and decimal fractions, percentages and mensuration.

- 3.3 The various terms used in rotorcraft construction and aerodynamics, and the functioning of each component part of a rotorcraft.
- 3.4 The various terms used in construction of the engine ; the principles of operation, general construction and functioning of the engine, of each component part of the engine and of all ancillary devices necessary for the operation of the engine.
- 3.5 The inspection and checks necessary after assembly of rotorcraft structures, with particular reference to the assembly and functioning of rotor and transmission components.
- 3.6 The inspection of control mechanisms for defects and deterioration.
- 3.7 The inspection during and after adjustment of flying controls.
- 3.8 The diagnosis and correction of faults experienced in flight.
- 3.9 The inspection of transmission components including rotor heads and rotor blades to ensure correct functioning and operation.
- 3.10 General maintenance of the rotorcraft (including equipment), minor repairs and replacement of approved parts.
- 3.11 The inspection of undercarriages, brakes, wheels and tyres.
- 3.12 The principles of operation and the inspection of retracting undercarriage and steering systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.13 The principles of operation and the inspection of cabin air conditioning systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.14 The assembly, installation and inspection of the mechanism by which the automatic pilot (or auto stabilizer) servo motors are connected to the rotorcraft controls. Functioning checks to prove correct operation of the automatic pilot (or auto stabilizer) and the recognition of fault conditions.
- 3.15 The principles of operation, arrangement and inspection of fuel water/methanol, oil and coolant systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.16 The principles of operation and the inspection of carburettors, injectors and fuel control units ; tests for functioning ; diagnosis and rectification of defects.
- 3.17 The principles of operation of compressors and turbines ; supercharging ; the operation of controlling devices.
- 3.18 The principles of operation and the inspection of ignition systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.19 The principles of operation and the inspection of propellers and propeller controlling devices ; the preparation of propellers for installation ; checks during assembly to the propeller shaft and ground testing ; diagnosis and rectification of defects ; permissible limits for damage and methods of rectification.

- 3.20 Inspection checks and procedures before, during and after the installation and removal of engines.
- 3.21 Safety precautions during ground running ; testing and adjustment during ground running in accordance with the manufacturer's recommended procedure ; recognition, diagnosis and rectification of running faults.
- 3.22 General maintenance of the engine, ancillary devices and associated systems, methods of inspection for defects ; clearances and allowances for wear and distortion ; minor repairs and replacement of approved parts.
- 3.23 The procedure for the partial dismantling and subsequent re-assembly of the rotorcraft, including engine(s), to permit inspection and rectification which may be certified by an engineer licensed in Categories "A" and "C" Rotorcraft.
- 3.24 Defects and deterioration of metallic materials ; treatments and methods of protection against corrosion.
- 3.25 Defects and deterioration of wooden structures, including treatments and methods of protection used.
- 3.26 Defects and deterioration of materials other than wood or metal. Treatments and methods used in rectifying defects and in protection.
- 3.27 The inspection and scope of investigation following heavy landings, lightning strikes and flight in severe turbulence or hail.
- 3.28 The methods of checking instruments for correct functioning ; the inspection of instruments and instrument installations for condition.
- 3.29 The methods of checking electrical installations for correct functioning ; the inspection of electrical installations for condition.
- 3.30 The principles of operation and the inspection of hydraulic and pneumatic systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.31 The principles of operation and the inspection of anti-icing, de-icing and windscreen wiper systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.32 The principles and operation and the inspection of fire warning and extinguishing systems ; tests for functioning ; diagnosis and rectification of defects.
- 3.33 The preparation of a brief report, illustrated by sketches, if necessary, describing the replacements required in the event of damage, defect or wear.
- 3.34 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORIES "A" AND "C" ROTORCRAFT

Aeronautical engineering experience periods totalling:—	For a type specified in paragraph 7.1 of A.R.B. Notice No. 10.	3 years	For a type specified in paragraph 7.3 or 7.4 of A.R.B. Notice No. 10.
AND		3 years	3 years
this must include practical maintenance and/or inspection of airframes AND engines prior to flight, periods totalling:—	18 months, of which 6 months must relate to piston engines.	2 years, of which 6 months must relate to piston engines.	2 years, of which 6 months must relate to gas turbine engines.
AND			
this must include recent practical maintenance and/or inspection of rotorcraft, periods totalling:—	1 year. (See Note (ii).)	1 year, INCLUDING 6 months recent practical maintenance on a type(s) specified in paragraphs 7.2, 7.3 or 7.4.	1 year, INCLUDING 6 months recent practical maintenance on a type(s) specified in paragraphs 7.2, 7.3 or 7.4.
AND	Applicants must have completed a Schedule of Inspection Work on the type. (See Note (i).)	Applicants must have completed a Schedule of Inspection Work on the type (see Note (i)) and must have satisfactorily completed an appropriate Course on the type.	Applicants must have completed a Schedule of Inspection Work on the type (see Note (i)) and must have satisfactorily completed an appropriate Course on the type.

- NOTE: (i) In connection with Schedules of Inspection Work, see Chapter L1—2, paragraphs 2 and 3, and the Appendix to this Sub-section.
- (ii) This requirement may be reduced if an applicant holds Categories "A" and/or "C" (fixed wing aircraft). The Board will advise in particular cases.
- (iii) If the general experience requirement has been met for a type specified in paragraph 7.2, 7.3 or 7.4 but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to supercharged piston engined rotorcraft or gas turbine engined rotorcraft, as appropriate.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—8 GRANT AND EXTENSION—CATEGORY "X" COMPASSES

- 1 EXPERIENCE REQUIRED** The table on page 24 shows the experience required in each case.

NOTE: For compasses in aircraft specified in paragraph 10 of A.R.B. Notice No. 10, see Chapter LI—12.

2 EXAMINATIONS

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.13, according to the construction and complexity of the type(s) for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted.
- 2.2 Applicants for the EXTENSION of a licence already valid in Category "X" Compasses will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "X" Compasses.
- 3.2 The general principles of magnetism, magnetic materials, and permanent magnets, polarity and strength of bar magnets, the earth as a magnet, the magnetic meridian and its relationship to the geographic meridian.
- 3.3 Electro magnetism, D.C. and A.C. electricity as applicable to remote-reading compasses ; definitions of the terms used and their application.
- 3.4 An elementary basic knowledge of electronic circuits including the methods of developing signals, amplification, phase discrimination ; an understanding of the terms used and their application. An understanding of the uses of thermionic valves, semi-conductor devices and transducers.
- 3.5 The preparation of a sketch to show a typical installation or explain a principle of operation including electrical circuit diagrams.
- 3.6 The general principles of construction and operation of the compass.
- 3.7 The inspection of screwed parts for defects, damage and locking. The types of screw threads used.
- 3.8 Details of the methods of installing the compass or its sub-assemblies in aircraft, including the initial settings and adjustments to be made and subsequent correct functioning procedures. The use of any conventional and special test equipment.

(syllabus continued on page 25)

EXPERIENCE REQUIRED FOR GRANT OF CATEGORY "X" COMPASSES

Aeronautical engineering experience which must include experience of compasses, periods totalling:—	Direct-reading magnetic compasses.	Direct-reading magnetic compasses and a type of remote-reading compass. (A single application is acceptable.)
AND	1 year	1 year, INCLUDING 3 months practical experience of the installation and compensation in aircraft of the type of remote-reading compass concerned.
recent experience of:—	the installation and compensation of 12 direct-reading compasses in aircraft.	the installation and compensation of 12 direct-reading compasses in aircraft and 6 compensations in aircraft of the type of remote-reading compass concerned.
AND	Applicants must have completed a Schedule of Inspection Work on the type(s).	(See Note (i).)

EXPERIENCE REQUIRED FOR EXTENSION IN CATEGORY "X" COMPASSES

A type of remote-reading compass if licence only valid for direct-reading compasses.	A type of remote-reading compass if licence valid for a type(s) of remote-reading compass.
3 months recent practical experience of the installation and compensation in aircraft of the type for which application is made and recent experience of 6 compensations of the type in aircraft.	Recent practical experience of the installation and compensation in aircraft of the type for which application is made and recent experience of 3 compensations of the type in aircraft.

AND

Applicants must have completed a Schedule of Inspection Work on the type(s). (See Note (i).)

NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI-2, paragraphs 2 and 3, and the Appendix to this Sub-section.
(ii) If the general experience requirement has been met for a type of remote-reading compass but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to such compasses.

- 3.9 The methods adopted for proving a site as being suitable for swinging aircraft for compass correction and the preparation of a swinging base.
- 3.10 The conventional methods and procedures adopted in swinging, compensating and adjusting the compass, including the observation of deviations and the calculations and adjustments necessary for correction of co-efficients A, B and C. The preparation of deviation cards and graphs.
- 3.11 The periodical maintenance and inspection required ; the effect of replacement of separate units within a particular system and the subsequent adjustments and tests to be carried out.
- 3.12 The types of defect which may develop in operation ; methods adopted to diagnose the faults.
- 3.13 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—9 GRANT AND EXTENSION—CATEGORY "X" INSTRUMENTS

- 1 **EXPERIENCE REQUIRED** The table on page 27 shows the experience required in each case.

NOTE: For instruments in aircraft specified in paragraph 10 of A.R.B. Notice No. 10, see Chapter LI—12.

- 2 **EXAMINATIONS**

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.15, according to the construction and complexity of the type(s) for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted.
- 2.2 Applicants for the EXTENSION of a licence already valid in Category "X" Instruments will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

- 3 **SYLLABUS**

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "X" Instruments.

- 3.2 Elementary physics insofar as they apply to the atmosphere, temperature and pressure ; the elementary mathematical calculations involved.
- 3.3 Elementary magnetism and electro-magnetism, D.C. and A.C. electricity as applicable to aircraft instruments ; definition of the terms used, their application and the elementary mathematical calculations involved.
- 3.4 An elementary basic knowledge of electronic circuits including the methods of developing signals, amplification and phase discrimination ; an understanding of the terms used and their application ; an understanding of the uses of thermionic valves, semi-conductor devices and transducers.
- 3.5 The preparation of a sketch to show a typical installation or explain a principle of operation, including electrical circuit diagrams.
- 3.6 The general principles of construction and operation of physically, mechanically, and electrically operated instruments and instrument systems installed in aircraft.
- 3.7 The general principles of construction and operation of electronically operated instruments and instrument systems installed in aircraft, including systems which record information concerning the operation or performance of the aircraft.
- 3.8 The principles of operation of test apparatus normally used for *check* calibration and testing purposes ; the methods employed to ascertain serviceability of the apparatus.
- 3.9 The inspection of screwed parts for defects, damage and locking, including pipe couplings. The types of screw threads used.
- 3.10 The details of the methods of installation of instruments or their sub-assemblies ; the initial settings and adjustments to be made ; the methods of carrying out necessary tests and *check* calibrations both prior to and after installation ; the type of test and calibrating equipment for this purpose and the methods of use.
- 3.11 The periodical maintenance and inspection required on instruments or instrument systems, the effect of replacement of separate units within a particular system and the subsequent adjustments and tests to be carried out.
- 3.12 The methods of testing pitot, static, and vacuum systems.
- 3.13 The methods of inspecting and testing instrument cables and looms for continuity, bonding and insulation.
- 3.14 The types of defect which may develop in operation ; methods adopted to diagnose and rectify the faults.
- 3.15 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORY "X" INSTRUMENTS

Aircraft instrument experience, periods totalling:—

The aircraft specified in paragraph 8.1 or 8.2 of A.R.B. Notice No. 10.

3 years

The aircraft specified in paragraph 8.3, 8.4, 8.5, 8.6 or 8.7 of A.R.B. Notice No. 10.

3 years

The aircraft specified in paragraph 8.8, 8.9 or 8.10 of A.R.B. Notice No. 10.

3 years

OR

The applicant shall hold a Category "X" Electrical Licence or a Category "A" (R) Aircraft Radio Maintenance Engineer's Licence.

AND, in all cases, recent practical experience of installation, testing and maintenance of instruments in aircraft, periods totalling:—

1 year, INCLUDING 3 months on instruments in aircraft specified in the paragraph for which application is made.

1 year, INCLUDING 6 months on instruments in aircraft specified in a paragraph(s) subsequent to paragraph 8.2 or in paragraph 10.1.

1 year, INCLUDING 6 months on instruments in aircraft specified in a paragraph(s) subsequent to paragraph 8.2 or in paragraph 10.1.

AND:—

Applicants must have completed a Schedule of Inspection Work (See Note (i)) on one or more of the aircraft specified in the paragraph for which application is made.

Applicants must have completed a Schedule of Inspection Work (See Note (i)) on the aircraft specified in the paragraph for which application is made and must have satisfactorily completed an appropriate Course on the aircraft concerned.

NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-section.

(ii) If the general experience requirement has been met but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to the paragraph(s) for which application is made.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—10 GRANT AND EXTENSION—CATEGORY "X" ELECTRICAL

1 EXPERIENCE REQUIRED The table on page 29 shows the experience required in each case.

2 EXAMINATIONS

2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.16, according to the construction and complexity of the type(s) for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted.

2.2 Applicants for the EXTENSION of a licence already valid in Category "X" Electrical will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type(s) for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE : This syllabus should be read in conjunction with A.R.B. Notice No. 3.

3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "X" Electrical.

3.2 Elementary electricity and magnetism ; definition of the units used, their application and the elementary practical mathematical calculations involved.

3.3 Elementary A.C. theory, including R.M.S. values ; the combination of resistance, inductance and capacitance in circuits ; definitions of the terms used, their application and the elementary mathematical calculations involved.

3.4 The general principles of construction and functioning of electro-magnetic devices and induction machines.

3.5 The general principles of construction and functioning of switch gear, including contactors, relays and circuit breakers.

3.6 Cables used in aircraft electrical installations, including the various types of insulation covering and the current ratings ; the methods of making and subsequent inspection of terminations.

3.7 The preparation of a circuit diagram illustrating the symbols used to denote the various items of equipment.

3.8 The inspection of screwed parts for defects, damage and locking ; the types of screw threads used on aircraft electrical equipment.

(syllabus continued on page 30)

EXPERIENCE REQUIRED FOR GRANT OR EXTENSION OF CATEGORY "X" ELECTRICAL

Aircraft electrical engineering experience, periods totalling:	The aircraft specified in paragraph 9.1 or 9.2 of A.R.B. Notice No. 10. 3 years	The aircraft specified in paragraph 9.3, 9.4, 9.5, 9.6 or 9.7 of A.R.B. Notice No. 10. 3 years	The aircraft specified in paragraph 9.8, 9.9, 9.10, 9.11 or 9.12 of A.R.B. Notice No. 10. 3 years
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OR

The applicant shall hold a Category "X" Instruments Licence or a Category "A" (R) Aircraft Radio Maintenance Engineer's Licence.

AND, in all cases, recent practical experience of installation, testing and maintenance of electrical equipment in aircraft, periods totalling:	1 year, INCLUDING 3 months on electrical equipment in aircraft specified in the paragraph for which application is made.	1 year, INCLUDING 6 months on electrical equipment in aircraft specified in a paragraph(s) subsequent to paragraph 9.2.	1 year, INCLUDING 6 months on electrical equipment in aircraft specified in a paragraph(s) subsequent to paragraph 9.2.
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AND:—

(i) If the general experience requirement has been met but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to the paragraph(s) for which application is made.	Applicants must have completed a Schedule of Inspection Work (See Note (i)) on one or more of the aircraft specified in the paragraph for which application is made.	Applicants must have completed a Schedule of Inspection Work (See Note (i)) on the aircraft specified in the paragraph for which application is made and must have satisfactorily completed an appropriate Course on the aircraft concerned.
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NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-section.

(ii) If the general experience requirement has been met but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to the paragraph(s) for which application is made.

- 3.9 The principles of operation of D.C. power generating systems, including their associated control and protective devices.
- 3.10 The principles of operation of A.C. power generating systems, including their associated control and protective devices.
- 3.11 The general principles of construction and functioning of electrical storage batteries.
- 3.12 The principles of operation of test apparatus ; the methods employed to ascertain serviceability of the apparatus.
- 3.13 The details of the methods of installation of electrical wiring systems and equipment ; the methods of carrying out necessary tests both prior to and after the installation ; the type of test equipment for this purpose and the methods of use.
- 3.14 The periodical maintenance and inspection required on electrical wiring systems and equipment, adjustments and tests to be carried out after replacement.
- 3.15 The types of defect which may develop in operation ; methods adopted to diagnose and rectify the faults.
- 3.16 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER LI—II GRANT AND EXTENSION—CATEGORY "X" AUTOMATIC PILOTS

- I **EXPERIENCE REQUIRED** The table on page 32 shows the experience required in each case.

NOTE: For automatic pilots in aircraft specified in paragraph 10 of A.R.B. Notice No. 10, see Chapter LI—12.

- 2 **EXAMINATIONS**

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on paragraph 3.1 and on BASIC AERONAUTICAL ENGINEERING applicable to subjects in paragraphs 3.2 to 3.13, according to the construction and complexity of the type for which application has been accepted. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted.
- 2.2 Applicants for the EXTENSION of a licence already valid in Category "X" Automatic Pilots will be required to reach a satisfactory standard in written and/or oral examination on subjects in the syllabus applicable to the type for which accepted. Where this introduces subjects which are not basically applicable to type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

3 SYLLABUS

NOTE: This syllabus should be read in conjunction with A.R.B. Notice No. 3.

- 3.1 The Air Navigation Order and Regulations, and the Board's Requirements and Recommendations appropriate to an aircraft maintenance engineer licensed in Category "X" Automatic Pilots.
- 3.2 Elementary physics insofar as they apply to oil and air under pressure.
- 3.3 Elementary magnetism and electro-magnetism, D.C. and A.C. electricity, definition of the terms used, their application and the elementary mathematical calculations involved.
- 3.4 An elementary basic knowledge of electronic circuits including the methods of developing signals, amplification and phase discrimination, and understanding of the terms used and their application ; an understanding of the uses of thermionic valves, semi-conductor devices and transducers.
- 3.5 The preparation of a sketch to show a typical installation or explain a principle of operation including electrical circuit diagrams.
- 3.6 The principles of construction and operation of the sub-assemblies and the automatic pilot as a whole, including any monitoring systems.
- 3.7 The inspection necessary prior to installation in the aircraft of the units which comprise the automatic pilot.
- 3.8 The inspection of screwed parts for defects, damage and locking, including pipe couplings ; the type of screw threads used.
- 3.9 The details of the methods of installation, the initial settings and adjustments to be made and subsequent ground testing procedures. The use of any conventional and specialised test equipment involved.
- 3.10 The methods of inspecting and testing inter-connecting cables and looms for bonding, continuity and insulation.
- 3.11 The periodical maintenance and inspection required, the effect of replacement of separate units within a particular system and the subsequent adjustments and tests to be carried out.
- 3.12 The types of defect which may develop in operation ; methods adopted to diagnose and rectify the faults.
- 3.13 Procedures and precautions to ensure the continued serviceability of spare parts and materials when in store.

EXPERIENCE REQUIRED FOR GRANT OF CATEGORY "X" AUTOMATIC PILOTS

Experience of the installation, maintenance and testing of:—	<p>One type of automatic pilot incorporating air-driven gyroscopes.</p> <p>automatic pilots, period totalling 18 months.</p>	<p>One type of automatic pilot incorporating electronic apparatus.</p> <p>electronic automatic pilots, periods totalling 18 months.</p>
	OR	OR
	<p>The applicant shall hold a Category "X" Instruments Licence.</p>	<p>The applicant shall hold a Category "X" Instruments Licence, a Category "X" Electrical Licence or a Category "A" (R) Aircraft Radio Maintenance Engineer's Licence.</p>

AND, in all cases, recent practical experience of the installation, testing and maintenance of the type of automatic pilot for which application is made, periods totalling:

3 months

3 months

AND

Applicants must have completed a Schedule of Inspection Work on the type. (See Note (i).)

EXPERIENCE REQUIRED FOR EXTENSION OF CATEGORY "X" AUTOMATIC PILOTS

<p>One type of automatic pilot incorporating air-driven gyroscopes.</p> <p>Applicants must have completed a Schedule of Inspection Work on the type. (See Note (i).)</p>	<p>One type of automatic pilot incorporating electronic apparatus.</p> <p>If the licence is NOT already valid for a type of automatic pilot incorporating electronic apparatus, the requirements are the same as those specified for the grant of such a licence.</p> <p>If the licence is already valid for a type of automatic pilot incorporating electronic apparatus, applicants must have completed a Schedule of Inspection Work on the type. (See Note (i).)</p>
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NOTE: (i) In connection with Schedules of Inspection Work, see Chapter LI—2, paragraphs 2 and 3, and the Appendix to this Sub-section.

(ii) If the general experience requirement has been met for a type of automatic pilot incorporating electronic apparatus but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to such automatic pilots.

SUB-SECTION L1—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

CHAPTER L1—12 GRANT AND EXTENSION—MULTI-CATEGORY "X" INSTRUMENTS, AUTOMATIC PILOTS AND COMPASSES

I EXPERIENCE REQUIRED

- 1.1 For the grant of a licence—4 years experience (see Note (i)) on instrument, automatic pilot and compass systems which must include at least 2 years solely on instrument, automatic pilot and compass systems in aircraft. Such aircraft must be a type(s) specified in paragraph 8.6 of A.R.B. Notice No. 10 or a paragraph subsequent thereto or in paragraph 10.1 of A.R.B. Notice No. 10. In addition, the applicant must have satisfactorily completed the appropriate Courses and must have completed a Schedule of Inspection Work on the type. (See Note (ii).)
- 1.2 For the extension of an instrument, and/or automatic pilot and/or compass rating to include a Multi-Category rating the applicant will be informed of the general experience required but in all cases satisfactory completion of the appropriate Courses and completion of a Schedule of Inspection Work on the type will be necessary. (See Note (ii).)
- 1.3 If the licence is already valid for a Multi-Category rating, applicants for an additional rating must satisfactorily complete the appropriate Courses and complete a Schedule of Inspection Work on the type. (See Note (ii).)

NOTE : (i) This experience requirement is reduced to 3 years if the applicant holds a Category "X" Electrical Licence or a Category "A" (R) Aircraft Radio Maintenance Engineer's Licence.
(ii) In connection with Schedules of Inspection Work, see Chapter L1—2, paragraphs 2 and 3, and the Appendix to this Sub-section.
(iii) If the general experience requirement has been met but the specific type experience requirements cannot be complied with, applications will be considered for examination on BASIC AERONAUTICAL ENGINEERING applicable to the Multi-Category.

2 EXAMINATIONS

- 2.1 Applicants will, before qualifying for TYPE examination, be required to reach a satisfactory standard in a written examination on BASIC AERONAUTICAL ENGINEERING applicable to subjects in the syllabi in Chapters L1—8, L1—9 and L1—11, according to the construction and complexity of the type for which application has been accepted and on the relevant parts of the Air Navigation Order and Regulations and the Board's Requirements and Recommendations. Applicants qualifying for TYPE examination will be required to reach a satisfactory standard in written and/or oral examination on subjects in the relevant syllabi applicable to the type for which accepted.
- 2.2 If the licence is already valid in one or more of the categories included in the Multi-Category for which application has been accepted, the examination on BASIC AERONAUTICAL ENGINEERING will only cover subjects which are not basically applicable to categories and/or type(s) already covered by the applicant's licence.

**AIRCRAFT MAINTENANCE ENGINEERS' LICENCES
GRANT AND EXTENSION—MULTI CATEGORY "X"
INSTRUMENTS, AUTOMATIC PILOTS AND COMPASSES**

2.3 Applicants for the EXTENSION of a licence already valid in a Multi-Category to include an additional Multi-Category will be required to reach a satisfactory standard in written and/or oral examination on subjects in the relevant syllabi applicable to the type for which accepted. Where this introduces subjects which are not basically applicable to categories and/or type(s) already covered by the applicant's licence, the applicant will also be required to answer questions on BASIC AERONAUTICAL ENGINEERING on the subjects concerned.

SUB-SECTION LI—AIRCRAFT MAINTENANCE ENGINEERS' LICENCES

APPENDIX

SCHEDULES OF INSPECTION WORK

1 PURPOSE OF SCHEDULE The purpose of a Schedule of Inspection Work is to ensure that the experience requirement is spread throughout the relevant subjects in the syllabus.

2 COMPILATION OF SCHEDULE

2.1 When considering the practical experience required, the applicant should take into account the construction and complexity of the type of aircraft, engine or equipment for which the licence is required, maintenance procedures, defect rectification and other relevant technical matters, and the duties and responsibilities which devolve on the holder of such a licence. He should compile the Schedule of Inspection Work to show that his practical experience is suitably varied and confirms his contention that he is a suitable person to hold such a licence.

2.2 Items in the Schedule must be verified by the person in charge or in a similar authoritative position by signature in the appropriate space in the Schedule. Where practical experience on items in the Schedule has been obtained during a Course, satisfactory completion of the Course will be accepted as verification of the items in question.

2.3 The following sub-headings, relevant to each Category, broadly represent what is required.

CATEGORY "A"

The Schedule of Inspection Work must include a representative selection of items of work carried out, or participated in, under each of the sub-headings appropriate to the type for which application is made, and must consist of inspection experience which is directly applicable to the installation and maintenance of the structures and/or mechanisms concerned and experience of any related **FUNCTIONING CHECKS, CALIBRATION CHECKS AND ADJUSTMENTS.**

1. Aircraft Structure
2. Flying Control Systems (including control surfaces)
3. Hydraulic and/or Pneumatic Systems
4. Landing Gear Systems
5. Pressurisation, Air Conditioning and Oxygen Systems
6. Ice and Rain Protection Systems
7. Fire Protection Systems
8. Minor Repairs
9. Ground Handling
10. Electrical Systems
11. Instrument Systems
12. Automatic Pilot Systems
13. Compass Systems
14. Defect Rectification

CATEGORY "B"

The applicant must hold a licence valid in Category "A" for the type concerned. Therefore, Schedules of Inspection Work are required covering the general items detailed in the syllabus and covering work carried out, or participated in, solely in relation to the major repair of the structure concerned and overhaul of relevant components.

CATEGORY "C"

The Schedule of Inspection Work must include a representative selection of items of work carried out, or participated in, under each of the sub-headings appropriate to the type for which application is made, and must consist of inspection experience which is directly applicable to the installation and maintenance of the structures and/or mechanisms concerned and experience of any related FUNCTIONING CHECKS, CALIBRATION CHECKS AND ADJUSTMENTS.

1. Engine and Power Plant Structure
2. Fuel System
3. Oil System
4. Ignition System
5. Propeller System
6. Ice Protection Systems
7. Fire Protection Systems
8. Minor Repairs
9. Electrical Systems
10. Instrument Systems
11. Defect Rectification
12. Engine and/or Power Plant Changes
13. Ground Running and Adjustments

CATEGORY "D"

Schedules of Inspection Work are required covering the general items detailed in the syllabus and covering work carried out, or participated in, solely in relation to the overhaul, repair and testing of the engine only.

CATEGORIES "A" AND "C" (ROTORCRAFT)

The Schedule of Inspection Work must include a representative selection of items of work carried out, or participated in, under each of the sub-headings appropriate to the type for which application is made, and must consist of inspection experience which is directly applicable to the installation and maintenance of the structures and/or mechanisms concerned and experience of any related FUNCTIONING CHECKS, CALIBRATION CHECKS AND ADJUSTMENTS.

1. Engine and Aircraft Structure
2. Flying Control Systems
3. Hydraulic and/or Pneumatic Systems
4. Landing Gear Systems
5. Minor Repairs
6. Air Conditioning System
7. Ice and Rain Protection Systems
8. Fuel System
9. Oil System

CATEGORIES "A" AND "C" (ROTORCRAFT) (Cont.)

10. Ignition System
11. Rotor and Propeller Systems
12. Transmission Systems
13. Fire Protection Systems
14. Minor Repairs
15. Electrical Systems
16. Instrument Systems
17. Automatic Pilot Systems
18. Compass Systems
19. Defect Rectification
20. Engine and/or Power Plant Changes
21. Ground Running and Adjustments

CATEGORY "X"—INSTRUMENTS

The Schedule of Inspection Work must include a representative selection of items of work carried out, or participated in, under each of the sub-headings appropriate to the type for which application is made, and must consist of inspection experience which is directly applicable to the installation and maintenance of the mechanisms concerned and experience of any related FUNCTIONING CHECKS, CALIBRATION CHECKS AND ADJUSTMENTS.

1. Circuit Installation and Testing
2. Pressure Indicating Systems
3. Temperature Indicating Systems
4. Speed Indicating Systems
5. Quantity Indicating Systems
6. Flow Indicating Systems
7. Position Indicating Systems
8. Altitude Indicating Systems
9. Gyro Instrument Systems
10. Integrated Flight System
11. Defect Rectification

CATEGORY "X"—ELECTRICAL

The Schedule of Inspection Work must include a representative selection of items of work carried out, or participated in, under each of the sub-headings appropriate to the type for which application is made, and must consist of inspection experience which is directly applicable to the installation and maintenance of the mechanisms concerned and experience of any related FUNCTIONING CHECKS, CALIBRATION CHECKS AND ADJUSTMENTS.

1. A.C. Power Generation and Distribution Systems
2. D.C. Power Generating and Distribution Systems
3. Batteries
4. Circuit Installation and Testing
5. Engine Starting System
6. Engine and Propeller, and/or Rotor Control Systems
7. Fuel System

CATEGORY "X"—ELECTRICAL (Cont.)

8. Oil System
9. Fire Protection Systems
10. Ice and Rain Protection Systems
11. Air Conditioning and Pressurisation Systems
12. Flying Control Systems
13. Hydraulic and/or Pneumatic Systems
14. Landing Gear Systems
15. Defect Rectification

CATEGORY "X"—AUTOMATIC PILOTS

An applicant is required to indicate experience of the general items detailed in the syllabus and the Schedule of Inspection Work should provide details of installation, inspection, adjustment and testing, and of defect rectification relating to the type of automatic pilot for which application is made.

CATEGORY "X"—COMPASSES

An applicant is required to indicate experience of the general items detailed in the syllabus and the Schedule of Inspection Work should provide details of installation, inspection, testing, swinging, compensation and adjustment, and of defect rectification relating to the type(s) of compass for which application is made.

MULTI-CATEGORY "X"—INSTRUMENTS, AUTOMATIC PILOTS AND COMPASSES

The Schedule of Inspection Work is required to include details, relevant to the type for which application is made, under the applicable sub-headings detailed for Category "X"—Instruments, Automatic Pilots and Compasses, except that, if application is made for this rating excluding compensation and adjustment of compasses, experience relative to these duties is not required.